CERTAIN PERSISTENT ERRORS IN GEOGRAPHY.

BY

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In many of the text-books on geography used in the schools to-day old legends which were taught as truths a generation or more ago still survive, in spite of the fact that they have been discredited by geographers for many years. In consequence, these incorrect ideas are still accepted by the great mass of the people, and it is probable that another generation will pass before the truth will filter down from geographers into the text-books and from the text-books to the people.

An example of the persistence of error is the idea that the presence or absence of forests has an influence upon the amount of rainfall. Some keen observer long ago detected the fact that forested regions enjoyed a heavier rainfall than those not forested, and jumped to the conclusion that rainfall was produced by forests, and, as a corollary, that the removal of forests diminished the rainfall. Looking over the earth he found many treeless, desert, and semi-desert regions, and forthwith instanced them as frightful examples of the result of man's wastefulness in destroying the forests. Prominent among these examples are the shores of the Mediterranean, including the Iberian Peninsula, Italy, northern Africa, and Syria, which are often quoted as favourite illustrations of man's destruction of climate by his destruction of the forests.

In reply to this charge man can certainly plead not guilty. If his accusers had possessed a little more knowledge of the causes of climate and the conditions which modify it they would have seen at once that the geography of this Mediterranean region, the present configuration of the land and water, and the prevailing winds are such as to give it a light rainfall, forests or no forests. Furthermore, a knowledge of physiography would have taught them, in corroboration of the above, that the arid or semi-arid conditions now existing must have existed for many thousands, if not millions, of years, for the mountains, cliffs, and cañons are such as are carved only in arid regions, are not those of a moist climate, and these forms have not been made in a day. The situation is simply that the cart has been placed before the horse. Want of rain prevents the growth of trees; want of trees does not prevent rain.

This position is generally accepted among physical geographers, but the majority of the people still reverse cause and effect.

A persistent, widespread, and well-rooted error is the belief that floods in our rivers are greater and more frequent than formerly, and that this is due to the removal of forests from their drainage areas. Every great flood induces another flood of editorial paragraphs in the newspapers to the effect that man, by clearing away forests, has increased the flood-height of streams, and correspondingly diminished the low-water flow.

It is probable, although it has not been proved, that the clearing of land, by cutting away the forests and undergrowth, does change the regimen of streams, increasing their flood-height and diminishing the flow at low stages. In other words, water probably runs off or evaporates more rapidly from bare ground than from ground which is covered with trees or other forms of vegetation. But where the forests are cut away the land is seldom left bare; it is cultivated or quickly becomes covered with bushes, which hold the water quite as effectively as forests.

The main fact, however, is that the floods in our rivers are no greater or more frequent now than in the past. The Ohio river, for instance, has been gauged continuously for many years, and these gaugings show no appreciable change in regimen, whatever changes may have been made in the forest cover of its basin.

In the school geographies we are taught that the fiords of the coast of Norway, those deep gorges, partly filled by the sea, are proof that the coast has been sinking. How could such cañons be cut, it is asked, unless at the time of their construction they were above sea-level? But to-day, on the coast of Alaska, we see just such cañons in course of construction below sea-level. On this coast are scores of glaciers travelling in gorges which, near their lower ends, are many hundred feet below the level of the sea. The Muir Glacier, where its front meets the sea, is over 800 feet thick, 600 feet of which is below the level of the water, and this, like all other glaciers, is constantly carving its bed deeper. The Norwegian fiords were cut by glaciers, and, probably, while the sea and land were at the same relative levels. The coast of Norway may be sinking, but its fiords are not evidence of it.

Other familiar errors concern climate still more directly. The well-known mild climate of the northwest coast of America is commonly attributed to the balmy influences brought to it by the Japan Current; the Gulf Stream is supposed to have the same influence upon the west coast of Europe; and the cold climate of the east

coast of the United States is attributed to a supposed current from the Arctic Ocean hugging this coast.

That these explanations do not explain will be realized after reflection. Can it be supposed that the Japan Current, however warm it may be when it leaves the tropics, retains any appreciable amount of heat after a journey of 6,000 miles in northern latitudes? As a matter of fact, no trace of this current reaches the shores of North America, its force being entirely lost thousands of miles to the westward. There is nothing left but the merest drift of the surface water before the prevalent west wind.

In the North Atlantic the condition is much the same. The Gulf Stream loses its velocity and disappears as a current long before the British Isles are reached. That the cold climate of the eastern coast of the United States is caused by an Arctic current close inshore is disproved by the fact that there is no such current along this coast.

There is probably no phenomenon connected with the physical life of the earth which has been the subject of greater misconceptions than the currents of the sea. The maps of the school books are covered with lines and arrows, indicating currents in every conceivable direction, every temporary drift of surface water reported by navigators having apparently been recorded as a current.

The system of oceanic currents is very simple: a drift of water towards the Equator, a current along it, flowing westward to the land, there dividing, flowing north and south and dispersing.

This equatorial current has been attributed in the text-books to a variety of causes. The unequal heating of sea-water in different latitudes is a favourite explanation. This, however, could produce currents only by changing the volume of the heated water, and, unfortunately, if the water under the Equator were appreciably expanded by heat, it would cause currents in the opposite direction from those which exist. We should find them flowing away from the Equator instead of toward it.

Another explanation given is the increased evaporation in the tropics, thus lowering the surface of the water and causing an inflow from north and south. Were this of any appreciable magnitude it would undoubtedly cause a drift of water to equatorial regions, but there would be no corresponding outflow, such as the Gulf Stream and Japan Current.

A third cause assigned is the diminution of atmospheric pressure on the sea in the tropics, produced by the heating of the atmosphere and its consequent rarefaction. This amounts to a fraction of an

inch in the barometric column, and is, therefore, a small matter. Undoubtedly, if it had an appreciable effect upon the sea, this effect would take the form of a slight flow of water toward the Equator; but, when equilibrium was thus established, there would be no further flow toward the Equator, nor would there be any flow at all away from it.

Still another cause assigned is the increase in density of the water under the Equator, due to excessive evaporation, thus increasing the saltness of the water. It is difficult to see what effect would thus be produced were it appreciable.

The true cause of the ocean currents is sometimes mentioned in the text-books, but, excepting in two of the most recent ones, is given little or no prominence. The initial cause is the trade-winds. These blowing constantly from the northeast and southeast, induce a drift of the surface water in their directions. These two drifts meeting near the Equator flow along it westwardly, developing into a well-defined equatorial current. In the Atlantic this current, after flowing across the ocean, impinges on Cape St. Roque, Brazil, where it divides. The smaller part turns southward and skirts the coast of South America, fading out near the latitude of Cape Horn. The northern and much the larger part flows through the Caribbean Sea and the Gulf of Mexico, gathering strength and momentum in the narrow passages through which it is forced by the body of water behind it, and enters the Atlantic through the Strait of Florida. Here in the open sea it rapidly widens, shallows, and loses its velocity, and in the middle Atlantic is reduced to a mere drift, gradually turning southward to repeat its long journey.

What takes place in the Atlantic takes place on a much larger scale in the Pacific. Here from all parts of that great ocean within the tropics the surface water is driven to the neighbourhood of the Equator by the trade-winds. Along the Equator it flows for thousands of miles in a great current. On reaching the land it divides, and the southern portion subdivides time after time, and finally is lost among the maze of islands constituting Australasia. The northern part skirts the Japanese islands, gradually turning to the northeast, as it gets under the influence of the prevailing westerly winds, and soon disperses in the great waste of waters of the North Pacific.

These are the great oceanic movements. They are initiated by the winds, and their course is modified by the winds and by the shores. Besides changing the courses of the main currents, the

shores and islands divide the currents, sending off numberless little minor streams of water in various directions.

The land absorbs heat rapidly and as rapidly cools. Water, on the other hand, is heated slowly and holds its heat longer. Moreover, the sea is constantly in motion, its waves, tides, and currents —especially the latter—tending to create a uniform temperature throughout its mass. In consequence of all these conditions the sea has a much more uniform temperature in its different parts, and at different times, than the land. It is warmer in high latitudes and cooler near the Equator; it is warmer in winter and cooler in summer. It follows, further, that the coasts upon which the prevailing wind is from the sea share in this amelioration of climate, while the interior of continents and coasts upon which the prevailing winds are from the land do not share in this amelioration of climate.

Here we have the application of all that has gone before. Upon our northwest coast the prevailing winds are from the west, from the sea, and they bring to the coast the climate of the sea, which is warmer, on an average through the year, than the land, and also much warmer in winter and much cooler in summer. The coast of Europe is under similar conditions, while the east coast of the United States and of northern Asia is under reverse conditions. Here the prevailing winds, still being from the west, come from the land, and they give these coasts a continental or land climate, which is much colder in winter and warmer in summer. As was stated before, the cold climate of the east coast of the United States has been attributed to an Arctic current flowing close inshore. If there were such a current, it could have no effect upon the climate of this coast, since the prevailing winds are from the west, and could not bring the cold of the sea to the land.

There is a widespread notion that, in a mountainous region, all divides between streams must consist of mountain ranges, and in most maps ranges are shown in such positions, whether they exist or not. A mountain range may or may not divide drainage basins, and a divide may or may not consist of a mountain range.

Another mistake is the assumption that the highest peaks are always situated on the crest of the mountain range. This is their most common position, but in many cases the highest peaks are situated on spurs, at a distance from the crest.

We still find on many maps the main system of the Cordillera of North America represented as running in a direct line to the Arctic Ocean, just west of the mouth of the Mackenzie, in defiance of the

well-known fact that the main mountain system follows the coast through Alaska, and forms the backbone of the Alaskan Peninsula.

Many minor errors of a somewhat ludicrous character have been perpetuated in publications of authority, a few of which may be instanced:

For many years a town by the name of Goblin City appeared on the maps, placed on White River in western Colorado. It had no connection with other settlements; and, indeed, there were none within hundreds of miles. An enterprising map-maker, realizing that the inhabitants should have some means of communication with the outside world, made on his map a road from Goblin City eastward to other settlements, and this was afterwards carefully copied on other maps. A scientist who explored this region in 1876 looked for Goblin City, and found it. It was only a bit of Bad Land, to which an earlier explorer had fancifully given this name.

On the map of Colorado to-day appears the name Kahnah Creek, applied to a small branch of Gunnison river. The word *Kahnah*, in the Ute language, means, "I don't know," and was the answer given by an Indian when asked the name of the stream. This story is capped by the name Pah River, applied by an early army explorer to the North Fork of the Gunnison. It seems that, pointing to the stream, the explorer asked a Ute Indian its name. "Pah," answered the Indian. *Pah* is the Ute word for water.

Some years ago a Munchausen tale went the round of the newspapers to the effect that an explorer had discovered in the interior of New Guinea a mountain called by him Mount Hercules, and stated to be 35,000 feet high, thus exceeding Mount Everest in altitude by more than a mile. His narrative lacked certain elements of probability, as, among other things, the discoverer claimed to have climbed the great peak one morning before breakfast in an absurdly short time. His story was quickly discredited, but even now inquiries are frequently made concerning the existence of this purely mythical mountain.